



Base from U.S. Geological Survey, 1989
Projection and 10,000-meter grid, zone 12
Universal Transverse Mercator
25,000-foot grid ticks based on Montana
coordinate system, south zone
1927 North American Datum

APPROXIMATE MEAN
DECIMETER 1989

SCALE 1:100,000

2 1 0 1 2 3 4 5 6 7 8 9 10 MILES

2 1 0 1 2 3 4 5 6 7 8 9 10 KILOMETERS

CONTOUR INTERVAL 50 METERS
NATIONAL GEOLOGIC VERTICAL DATUM OF 1929

MONTANA

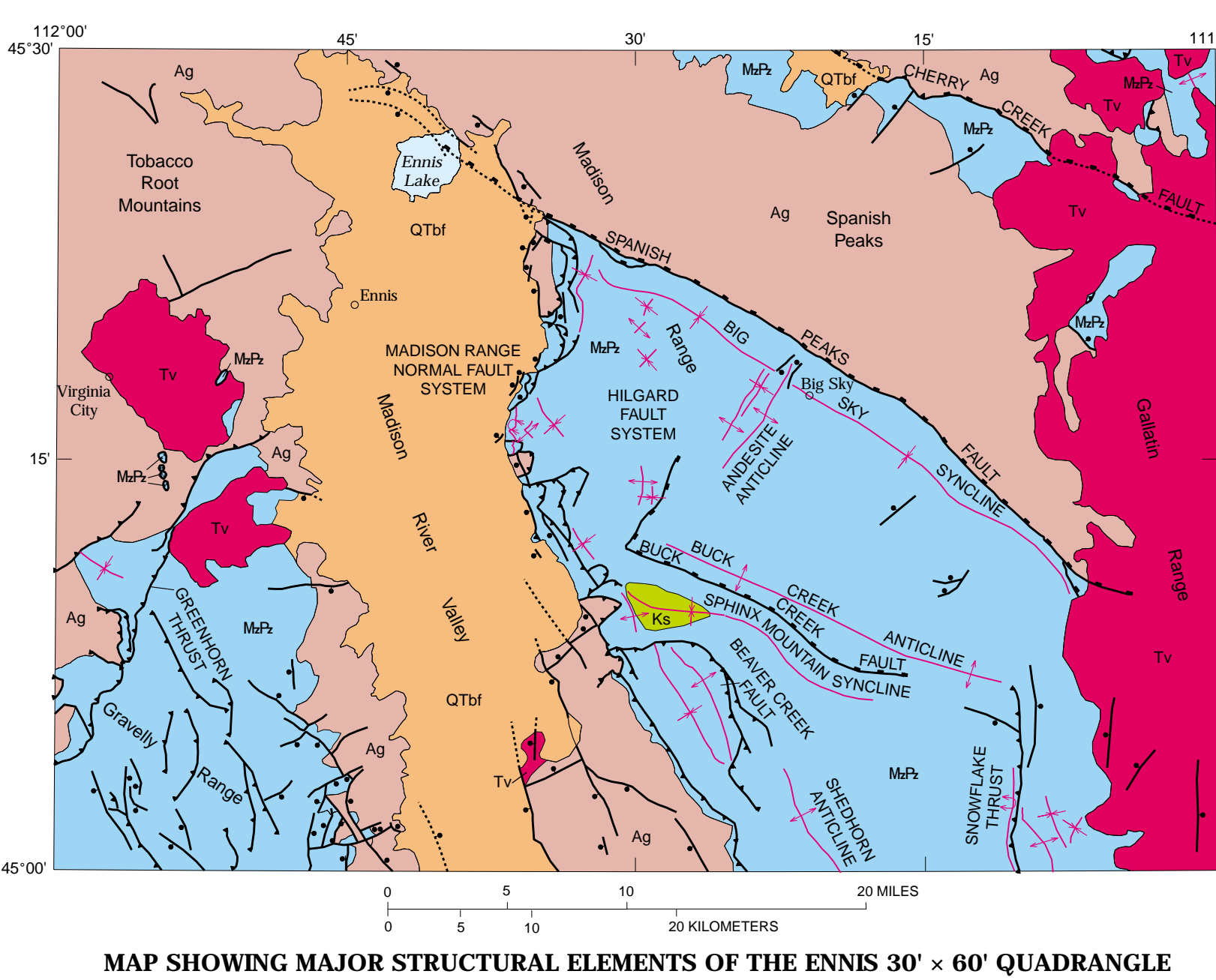
QUADRANGLE LOCATION

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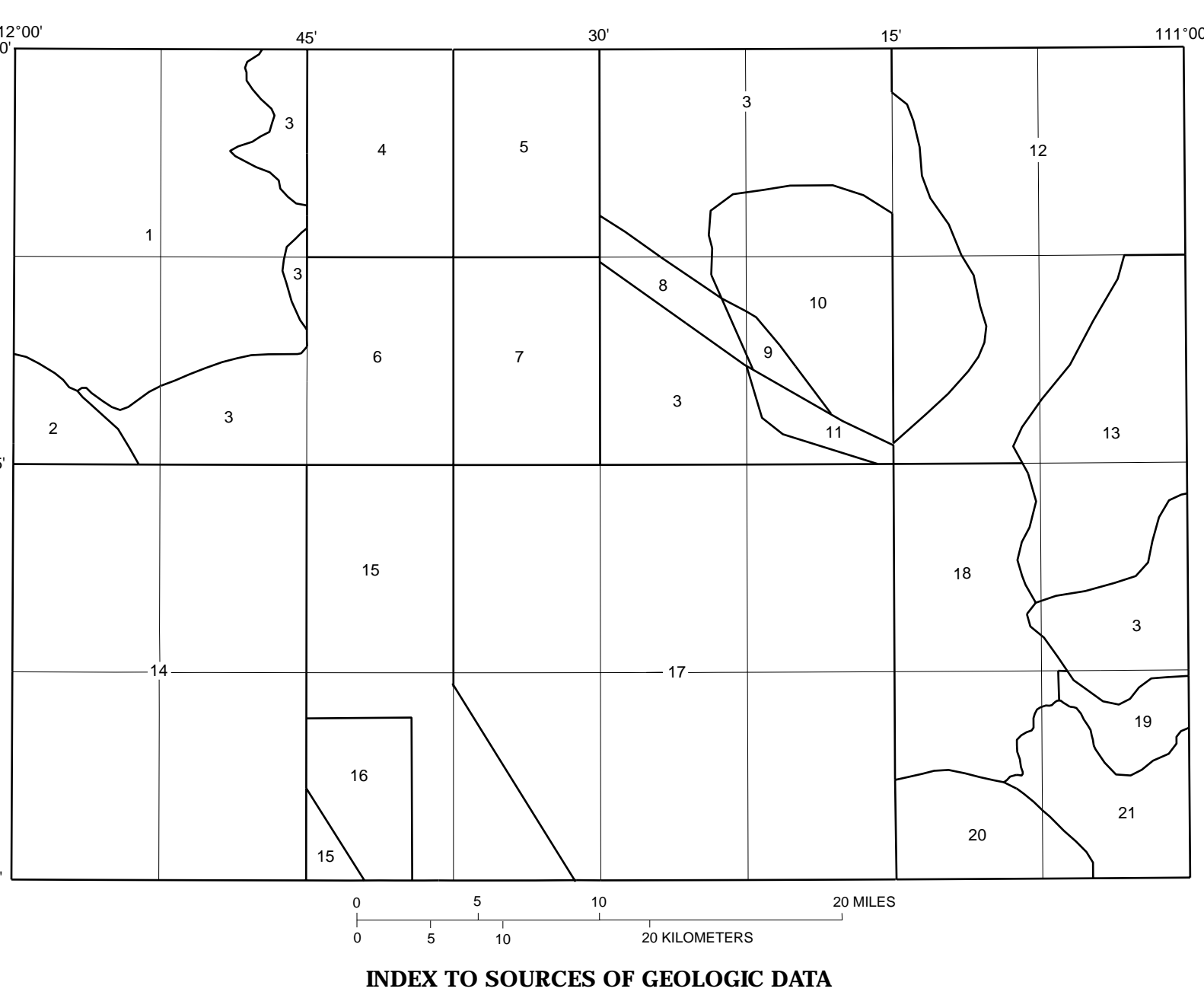
Edited by Diane E. Lane

Additional digital cartography and color design by Denny Welp

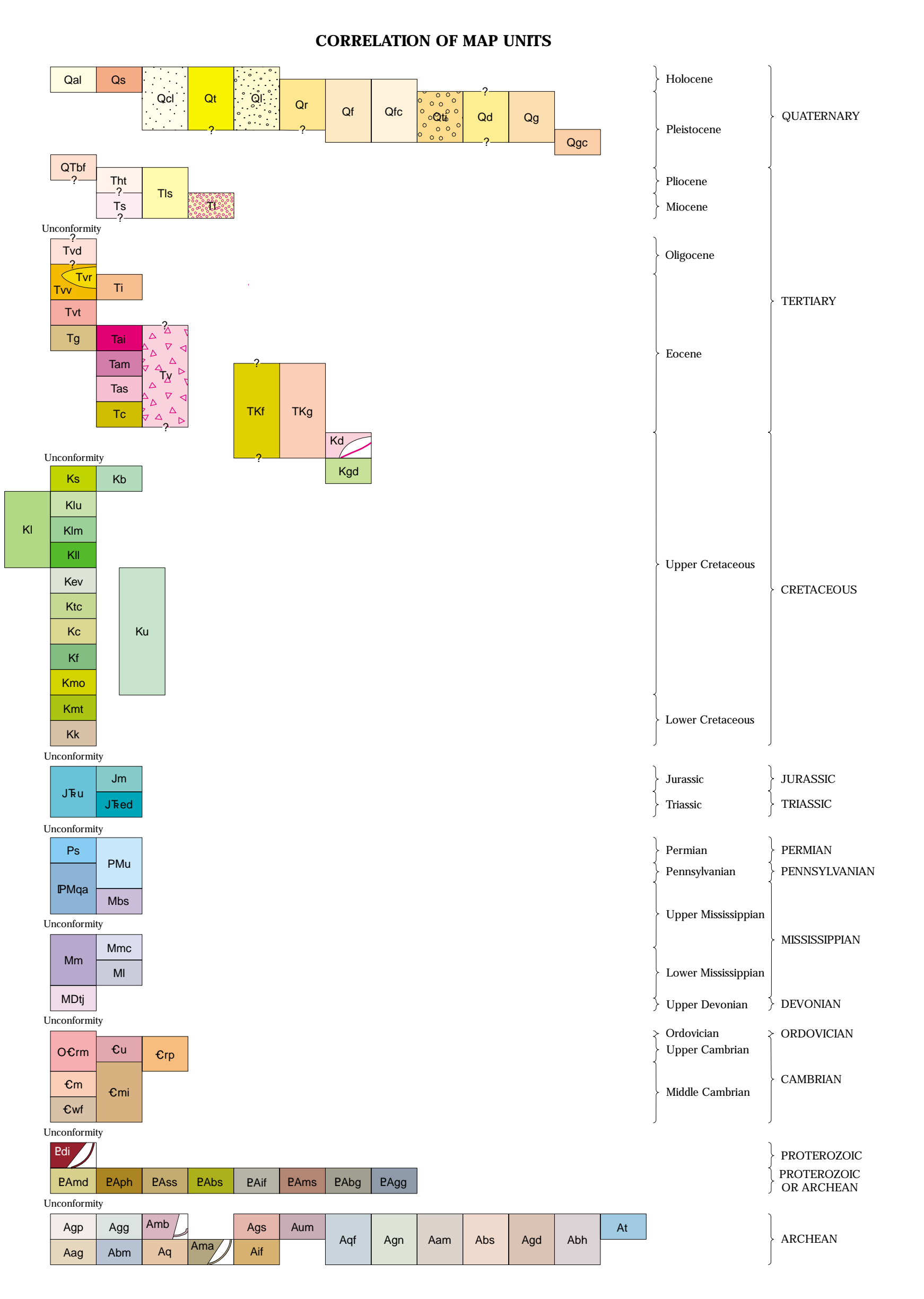
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- EXPLANATION**
- QTfL Basin-fill deposits (Quaternary and Tertiary)
 - TV Volcanic rocks (early Oligocene to middle Eocene)
 - Ks Sphinx Conglomerate (Upper Cretaceous)—Synorogenic
 - Mp Mesozoic and Paleozoic rocks of the continental platform
 - Ag Proterozoic(?) and Archean gneiss
 - Fault—Type unspecified
 - Normal fault—Dashed where concealed; bar and ball on downthrown side
 - Thrust fault—Dashed where concealed; sawtooth on upper plate
 - Reverse fault—Dashed where concealed; rectangle on upper plate
 - Anticline
 - Overturned anticline
 - Syncline
 - Overturned syncline



- Vitaliano and Cordus, 1979
 - Wier, 1982
 - Kellogg, K.S. unpub. mapping, 1994-96
 - Kellogg, 1993b
 - Kellogg, 1993a
 - Kellogg, K.S. unpub. mapping, 1993
 - Kellogg, 1992
 - Mogk, D.W. unpub. mapping, 1991
 - Sah, 1987
 - Kellogg, K.S., Lagoon, D.W., and O'Neill, J.M., (1994-95), unpub. mapping
 - Tysdal, R.G. (1984-86), and Kellogg, K.S. (1994-95), unpub. mapping
 - McMannis and Chadwick, 1964
 - Simons and others, 1985
 - Hadley, 1969b
 - Hadley, 1969a
 - Vargo, 1990
 - Tysdal, 1990
 - Hall, 1961
 - Modified from Todd, 1969
 - Laer, 1967
 - U.S. Geological Survey, 1972
- Contact**—Showing dip. Dashed where approximately located; dotted where concealed.
- Fault**—Predominantly normal movement. Dashed where approximately located; dotted where concealed. Bar and ball on downthrown side where known.
- Thrust fault**—Dashed where approximately located; dotted where concealed. Sawtooth on upper plate. Significant buckling (normal movement) may have occurred along some thrust faults.
- Reverse fault**—Dashed where approximately located; dotted where concealed. Rectangles on upthrown plate. Dip greater than 45°.
- Low angle normal fault**—Shown only in northern Gravelly Range, near Mission Canyon. Limestone overlies, with fault contact, Archean rocks.
- Anticline or antiform**—Trace of axial plane; dotted where concealed.
- Overturned anticline or antiform**—Trace of axial plane; dotted where concealed; small arrows show dip directions of limbs.
- Synform or syncline**—Trace of axial plane; dotted where concealed.
- Overturned syncline or synform**—Trace of axial plane; dotted where concealed. Small arrows show dip directions of limbs.
- Strike and dip of beds**
- Inclined
 - Vertical
 - Overturned
 - Horizontal
- Strike and dip of foliation**
- Inclined
 - Vertical



- LIST OF MAP UNITS**
- Qal Alluvium (Holocene)
 - Qs Swamp deposits (Holocene)
 - Qd Colluvium and loess (Holocene and upper Pleistocene)
 - Qc Talus deposits (Holocene and upper Pleistocene?)
 - Qf Landslide deposits (Holocene and upper Pleistocene)
 - Ql Rock glacier deposits (Holocene and upper Pleistocene?)
 - Qm Fan deposits (Holocene and upper Pleistocene)
 - Qn Fan deposits of the Cedar Creek alluvial fan (Holocene and upper Pleistocene)
 - Qo Terrace gravel deposits (upper Pleistocene)
 - Qp Diamicton (upper? Pleistocene)
 - Qq Terrace gravel deposits (upper Pleistocene)
 - Qr Terrace gravel deposits of the Cameron beach (Pleistocene)
 - Qs Basin fill deposit (Pleistocene and Pliocene?)
 - Qt Huckleberry Ridge Tuff (Pliocene)
 - Qv Old landslide deposits (Pliocene and Miocene)
 - Qw Limestone, sandstone, conglomerate, and ash deposits (Miocene?)
 - Qx Freshwater limestone (Miocene)
 - Qy Volcanic rocks of Virginia City volcanic field (Oligocene and Eocene)
 - Qz Diatreme (Oligocene?)
 - Qa Andesite and basalt flows (Oligocene and Eocene)
 - Qb Rhyolite flows (Oligocene or Eocene)
 - Qc Felsic tuff (Eocene)
 - Qd Volcaniclastic sandstone and gravel deposits (Eocene)
 - Qe Volcanic rocks of undetermined affinity (Oligocene and/or Eocene)
 - Qf Andesite and basalt flows
 - Qg Dacite porphyry sills and stocks (Eocene)
 - Qh Absaroka Volcanic Supergroup (Eocene)
 - Qi Intrusive rocks
 - Qj Mt. Wallace Formation
 - Qk Sepulcher Formation
 - Ql Basal conglomerate and siltstone (lower Eocene)
 - Qm Intrusive felsite (lower Tertiary or Upper Cretaceous)
 - Qn Gabro sills (Eocene to Late Cretaceous)
 - Qo Dacite porphyry of Fan and Lone Mountains (Late Cretaceous)
 - Qp Granodiorite of Tobacco Root batholith (Late Cretaceous)
 - Qq Sphinx Conglomerate (Upper Cretaceous)
 - Qr Beaverhead Group (Upper Cretaceous)
 - Qs Livingston Formation, undivided (Upper Cretaceous)
 - Qt Upper member
 - Qv Middle member
 - Qw Lower member
 - Qx Everts Formation, Virgelle Sandstone, Telegraph Creek Formation, Cody Shale, Frontier Formation, and Mowry Shale, undivided (Upper Cretaceous)
 - Qy Telegraph Creek Formation (Upper Cretaceous)
 - Qz Cody Shale (Upper Cretaceous)
 - Qa Frontier Formation (Upper Cretaceous)
 - Qb Mowry Shale (Upper Cretaceous)
 - Qc Muddy Sandstone and Thermopsis Shale, undivided (Lower Cretaceous)
 - Qd Kootenai Formation (Lower Cretaceous)
 - Qe Morrison Formation (Upper Jurassic), Ellis Group (Upper and Middle Jurassic), and Woodside Siltstone and Diawood Formation (Lower Triassic), undivided
 - Qf Morrison Formation (Upper Jurassic)
 - Qg Swift Sandstone, Rietzen Limestone, and Sawtooth Formation of Ellis Group (Upper and Middle Jurassic), Woodside Siltstone (Lower Triassic), and Diawood Formation (Lower Triassic), undivided
 - Qh Shoshone Sandstone (Lower Permian), Quadrant Sandstone (Pennsylvanian), and Ansdon Group (Lower Pennsylvanian and Upper Mississippian), undivided
 - Qi Shoshone Sandstone (Lower Permian)
 - Qj Quadrant Sandstone (Pennsylvanian), Ansdon Group (Lower Pennsylvanian and Upper Mississippian), and Snowcrest Range Group (Upper Mississippian), undivided
 - Qk Big Sioux Group (Upper Mississippian)
 - Ql Madison Group, undivided (Upper and Lower Mississippian)
 - Qm Mission Canyon Limestone (Upper and Lower Mississippian)
 - Qn Lodgepole Limestone (Lower Mississippian)
 - Qo Three Forks Formation (Lower Mississippian and Upper Devonian and Jefferson Formation (Upper Devonian), undivided
 - Qp Big Horn Dolomite(?) (Ordovician), Red Lion Formation (Upper Cambrian), Pilgrim Dolomite (Upper Cambrian, and Park Shale (Middle Cambrian), undivided
 - Qq Red Lion Formation and Pilgrim Dolomite, undivided (Upper Cambrian)
 - Qr Red Lion Formation (Upper Cambrian), Pilgrim Dolomite (Upper Cambrian), and Park Shale (Middle Cambrian), undivided
 - Qs Park Shale, Meagher Limestone, Wolsey Formation, and Flathead Sandstone, undivided (Middle Cambrian)
 - Qt Meagher Limestone (Middle Cambrian)
 - Qv Wolsey Shale and Flathead Sandstone, undivided (Middle Cambrian)
 - Qw Diabase dike (Proterozoic)
 - Qx Metadiorite
 - Qy Epidote-actinolite metasediment
 - Qz Biotite-chlorite schist
 - Qa Phyllite
 - Qb Mylonitic schist
 - Qc Sepulcher Formation
 - Qd Biotite gneiss, quartzite, and hornblende gneiss
 - Qe Granite, migmatite, pegmatite, and granitic orthogneiss
 - Qf Iron-formation
 - Qg Meta-igneous rocks (ARCHEAN)
 - Qh Dacite porphyry of Fan and Lone Mountains (Late Cretaceous)
 - Qi Granitic orthogneiss
 - Qj Metabasite
 - Qk Hornblende-biotite granodiorite orthogneiss of Summit Lake
 - Ql Meta-ultramafic rocks
 - Qm GNESSIC ROCKS OF UNKNOWN ORIGIN (ARCHEAN)
 - Qn Quartzofeldspathic gneiss
 - Qo Garnetiferous gneiss of the Tobacco Root Mountains
 - Qp Hornblende-plagioclase gneiss and amphibolite
 - Qq Biotite schist
 - Qr Gabbro and cummingtonite gneiss
 - Qs Biotite-hornblende gneiss of Beartrap Canyon
 - Qt HIGH-GRADE TECTONICS (ARCHEAN)
 - Qv Mylonite of the Crooked Creek shear zone
 - Qw METASEDIMENTARY ROCKS (ARCHEAN)
 - Qx Aluminous gneiss and schist
 - Qy Biotite-muscovite gneiss
 - Qz Quartzite
 - Qa Marble
 - Qb Iron formation